

14.5; Kendall, 13; Geneva, 10.8; South Canisteo, 10.7; Fleming, Keene Valley, and Queensbury, 10. *North Carolina*.—Bryson City, 0.5. *North Dakota*.—Bismarck, 8.3. *Ohio*.—Kent, 9. *Oregon*.—Veronia, 68.6; Saint Helen, 60.1; Forest Grove, 39; East Portland, 38; Hood River, 35.9; Portland, 35.3; Beulah, 30; McMinnville and Huntington, 28.5; The Dalles, 28; North Powder, 26; Telocaset, 24.5; Astoria, 22.5; La Grande, 22; Jordan Valley, 20.8; Grass Valley, 15.2; Joseph, 14.5; Hubbard, 14; Baker City, 13.2; Eola and Lone Rock, 12.5. *Pennsylvania*.—Blue Knob, 16; Greenville, 11; Corry and Honesdale, 10. *Rhode Island*.—Bristol, Kingston, and Providence, 4. *South Dakota*.—Spearfish, 21; Canton, 16.5; *Tennessee*.—Cumberland Gap, 0.1. *Texas*.—Fort Elliott, 2. *Utah*.—Corinne, 38; Ogden, 33.5; Salt Lake City, 30.8; Kelton and Nephi, 25; Levan, 19.5; Beaver, 18.5; Promontory, 17; Terrace, 12.5. *Vermont*.—East Berkshire, 23.6; Chelsea, 22; Strafford, 21; Jacksonville, 19; Northfield, 16.8; Brattleborough and Burlington, 16; Lunenburg, 12; Hartland, 11. *Virginia*.—Bolar, 1. *Washington*.—Fort Spokane, 39; Blakely, 31.8; Vancouver Barracks, 29; Spokane Falls, 24.8; Walla Walla, 22.7; Fort Walla Walla, 20; Fort Canby, 17.5; Fort Townsend, 12.5; Olympia, 12. *West Virginia*.—Buckhannon, 5.8. *Wisconsin*.—Green Bay, 28.4; Embarrass, 28.1; Phillips, 24; Medford, 21.5; Summit Lake, 18; Oshkosh, 14.5; Haywood, 14; Grantsburgh and Waucousta, 12. *Wyoming*.—Camp Sheridan, 52.5; Saratoga, 16; Fort Washakie, 13.6; Fort Bridger, 12.5.

#### DEPTH OF SNOW ON GROUND AT CLOSE OF MONTH.

Chart iv shows the depth of snow reported on the ground at the close of the month. In New England snow was reported on the ground to southern Massachusetts, and in central New Hampshire and eastern Maine the depth exceeded ten inches. In the middle Atlantic states no snow was reported south of central New York, and in the extreme east-central part of that state a depth of three inches was noted. In the lower lake region trace was reported along the south coast of eastern Lake Ontario and in the southern part of western New York. In the upper lake region there was a depth of over thirty inches in central upper Michigan and east-central Wisconsin, and snow was reported on the ground to central lower Michigan. In the central valleys snow was reported on the ground to east-

central Kansas, and there was a depth of ten inches in east-central South Dakota, and a depth of eighteen inches at Saint Vincent, Minn. In the Rocky Mountain and plateau regions snow was reported on the ground to central Colorado, southern Utah, and southern Nevada, and a depth of over forty inches was reported in central Idaho, and a depth of over thirty inches in central and extreme west-central Nevada. In the Pacific coast states snow was reported in the mountains east of the Sacramento River and north of the thirty-eighth parallel, in eastern and northern Oregon, and eastern Washington. In northeastern California and north-central Oregon a depth of more than twenty inches was reported.

#### HAIL.

Hail was reported as follows: 1st, Ark., 2d, 3d, and 4th, Cal. 5th, Cal., Kans., Me., N. H. 7th, Kans., Mo. 8th, N. Y. 9th, Wash. 11th, Kans., Mass., Mich., N. H., Pa. 12th, Ill., Mo. 14th, Ill. 15th, Mass., N. Y., Pa. 16th, Cal., Oregon. 17th, Cal. 19th, Ark., Cal. 20th, N. H. 21st, Cal., Conn., Pa. 22d, Cal., Ill., N. C. 23d, N. C. 24th, Pa. 25th, Nev., Oregon, Wash. 26th and 27th, Nev. 29th, Ala., Oregon. 30th, Nev., Wash. 31st, Mass.

#### SLEET.

Sleet was reported as follows: 1st, Ind., N. J. 3d, Ariz., Cal., Iowa, Kans., Mass., Minn. 4th, Cal., D. C., Iowa, Mich., Minn., Mo., Nebr., Wis. 5th, Cal., Iowa, Kans., Minn., Mo., N. Y., N. C., Tex., Vt. 6th, Ill., Ind. T., Kans., Mo., N. H., N. Y. 7th, Ariz., Ill., Ind. T., Kans., Mo., Pa. 8th, Mass., N. Y., Pa. 9th, Ind., Iowa, Ohio, Va. 10th, Mass., Nebr., N. Y., Oregon. 11th, Conn., Iowa, Kans., Mass., Mo., Nebr., N. H., N. Y., Ohio, Pa., Vt. 12th, Cal., Conn., Iowa, Kans., Mich., Mo., N. H., N. Y. 13th, Kans., Mich., Mo., N. H., N. Y., Ohio, Tenn., Vt. 14th, Ariz., Ark., Ill., Ind., Mo., Ohio, Pa., Tenn. 15th, Cal., Conn., Ind., Mass., N. H., N. Y., N. C., Pa., Tenn. 16th, Ind., Me., N. Y., Pa., Tenn. 18th and 19th, Kans. 20th, Ark., Ill., Ind., Ky. 21st, Conn., D. C., Kans., Mass., Mo., N. J., Pa., Tenn., Tex., Va. 22d, Ark., Ill., Ind., Kans., Minn., Mo., N. C., S. C., Tenn. 23d, Conn., Ga., Ind., Ky., Mo., N. Y., N. C., S. C., Tenn., Va. 14th, Kans., Oregon. 26th, Kans. 27th, Mass. 29th, Oregon, S. C., Tenn., Va. 30th, Ohio, Oregon, Pa. 31st, Conn., Mass., Vt.

#### WINDS.

The prevailing winds during January, 1890, are shown on chart ii by arrows flying with the wind. In New England the winds were mostly from west to northwest; in the middle Atlantic states, the lower lake region, on the middle-eastern slope of the Rocky Mountains, and over the southern plateau region from south to west; in Florida from north to east; in the east and west Gulf states, and on the north Pacific coast, from south to east; in the Ohio Valley and Tennessee, and over the northern plateau region, from southeast to southwest; in the upper lake region from southwest to northwest; in the extreme Northwest and in the Missouri Valley from north to northwest; in the upper Mississippi valley from south to northwest; in the middle plateau region from southeast to northeast; on the middle Pacific coast from southeast to east; on the south Pacific coast from northeast to east; and in the south Atlantic states, and over the northeastern and southeastern slopes of the Rocky Mountains, variable.

#### HIGH WINDS (in miles per hour).

Maximum velocities of fifty miles, or more, per hour were reported at regular stations of the Signal Service as follows: 2d, 50, se., at Fort Canby, Wash. 8th, 68, w., at Buffalo, N. Y. 9th, 56, w., at Cheyenne, Wyo.; 65, nw., at Wood's Holl, Mass.; 66, nw., at Block Island, R. I., and 60, nw., at New Haven, Conn. 12th, 56, sw., at Saint Louis, Mo., and 54, w., at Springfield, Mo. 13th, 50, nw., at Wood's Holl, Mass.; 54,

w., at Northfield, Vt.; 52, w., at Oswego, N. Y.; 60, w., at Rochester, N. Y.; 90, sw., at Buffalo, N. Y.; 50, s., at Toledo, Ohio; 72, sw., at Port Huron, Mich.; 58, sw., at Grand Haven, Mich., and 56, nw., at Lexington, Ky. 15th, 50, s., at Fort Canby, Wash. 16th, 55, nw., at Block Island, R. I., and 56, nw., at Wood's Holl, Mass. 20th, 64, w., at Buffalo, N. Y.; 54, w., at Rochester, N. Y.; 52, w., at Port Huron, Mich., and 50, w., at Grand Haven, Mich. 21st, 50, nw., at Buffalo, N. Y. 22d, 56, nw., at Wood's Holl, Mass.; 53, nw., at Block Island, R. I.; 55, nw., at New York City, and 50, nw., at Buffalo, N. Y. 24th, 54, sw., at Marquette, Mich., and 56, w., at Cheyenne, Wyo. 25th, 58, w., at Cheyenne, Wyo., and 51, sw., at Fort Canby, Wash. 26th, 52, s., at Fort Canby, Wash. 27th, 87, s., at Fort Canby, Wash. 28th, 78, s., at Fort Canby, Wash. 29th, 63, s., at Fort Canby, Wash. 30th, 58, s., at Fort Canby, Wash.; 56, w., at Cheyenne, Wyo., and 54, w., at Valentine, Nebr. 31st, 60, s., at Fort Canby, Wash.

#### LOCAL STORMS.

The most disastrous storms of the month occurred from the middle Mississippi valley to the Great Lakes, and thence eastward to New England during the 12th and 13th, within the area of a low pressure storm which first appeared as a feeble disturbance in the middle Rio Grande valley the night of the 11th, and thence moved northeastward with greatly increased energy, passing over the middle Mississippi valley to Lake

Miss. & Mo. Valley

Michigan during the 12th, and over Michigan and Lake Huron during the night of the 12-13th. Destructive local storms occurred at distances varying from one hundred and fifty to three hundred miles to the southward of the centre of the main depression during the afternoon of the 12th. At Saint Louis, Mo., a storm passed over the city at about 5 p. m. (75th meridian time), in a straight line from southwest to northeast, the path of destruction varying in width from five hundred to two thousand feet. The storm was preceded by thunder and lightning, and accompanied by heavy rain which lasted about three minutes. In the path of the storm three persons were killed, several injured, and about one hundred houses blown down or damaged, the greatest damage being done where the path of the storm was narrowest. The maximum wind-velocity at the Signal Service office was 56 miles per hour from the southwest. Crossing the Mississippi River the storm reached Brooklyn, Ill., distant about four miles from Saint Louis, where it caused considerable damage. At about the same hour a storm struck Clinton, Ky., killing ten persons, injuring upward of fifty others, and doing immense damage to buildings, many of the smaller of which were lifted bodily from their foundations. The path of the storm at Clinton was about three hundred yards wide. Great destruction was also caused at other places in western Kentucky, notably at Wickliffe and Moscow, and at points in the middle Mississippi and Ohio valleys. On the 12th a heavy snow storm, with high wind and falling temperature, prevailed over Minnesota, the Dakotas, Nebraska, Kansas, and Iowa, which, from Minnesota and the Dakotas

southwestward over Kansas, was a veritable "blizzard," the snow drifting heavily and causing a general blockade of the railroads. On the 12th and 13th the storm along the lower lakes and over Lake Huron was one of the severest experienced in many years, and was attended by fatalities and great destruction of property. At Springfield, Ill., the wind reached a maximum velocity of forty-four miles per hour from the southwest at 2.15 a. m. of the 13th. At Port Huron, Mich., a maximum velocity of seventy-two miles per hour from the southwest was registered at 7.35 a. m. of the 13th, and the storm was reported the severest that had been experienced at that place since the opening of the Signal Service station in 1874. At Buffalo, N. Y., the storm was reported the severest since the opening of the Signal Service station in 1870; the wind attained a maximum velocity of ninety miles per hour from the southwest at 11.15 a. m. of the 13th; great damage was caused to property in the city and vicinity, and the water in Lake Erie reached a height 7.6 feet above the mean water mark at 2.30 p. m. of the 13th, flooding that portion of the city called "the Island." At Rochester, N. Y., the anemometer became disabled at 10 a. m. of the 13th, at which time a velocity of sixty miles per hour from the west was recorded. At Oswego, N. Y., the storm was reported the most destructive of the season. The wind reached a maximum velocity of fifty-two miles per hour from the west at 2.11 p. m. of the 13th; several buildings were unroofed and other damage done. Severe disturbances also occurred over the Lake region during the 19th and 20th.

Lake Region

### INLAND NAVIGATION.

#### STAGE OF WATER IN RIVERS AND HARBORS.

The following table shows the danger-points at the several stations; the highest and lowest water during January, 1890, with the dates of occurrence and the monthly ranges:

Heights of rivers above low-water mark, January, 1890 (in feet and tenths).

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
<i>Red River:</i>						
Shreveport, La. ....	29.9	18	21.0	2	10.8	10.2
<i>Arkansas River:</i>						
Fort Smith, Ark. ....	22.0	16	14.2	1, 2	1.8	12.4
Little Rock, Ark. ....	23.0	18	17.3	1	4.2	13.1
<i>Missouri River:</i>						
Ft. Buford, N. Dak. ....	21.0	31	6.9	8	0.2	6.7
<i>Mississippi River:</i>						
Saint Paul, Minn. ....	14.5					
La Crosse, Wis. ....	24.0					
Dubuque, Iowa ....	15.0					
Davenport, Iowa ....	15.0	14	2.2	5	1.0	3.2
Keokuk, Iowa ....	14.0	20	6.0	8, 9	2.4	8.4
Saint Louis, Mo. ....	32.0	18	14.4	1	5.0	9.4
Cairo, Ill. ....	40.0	20, 21	43.7	2	18.5	25.2
Memphis, Tenn. ....	34.0	26	34.6	2	14.4	20.2
Vicksburg, Miss. ....	41.0	31	41.5	5	19.1	22.4
New Orleans, La. ....	15.0	31	13.3	5, 6, 7	5.9	7.4
<i>Ohio River:</i>						
Pittsburgh, Pa. ....	22.0	16	20.0	2	5.6	14.4
Parkersburg, W. Va. ....	38.0	18	29.9	3	8.9	21.0
Cincinnati, Ohio ....	50.0	21	43.8	5	18.9	24.9
Louisville, Ky. ....	25.0	22	20.2	2	9.2	11.0
<i>Cumberland River:</i>						
Nashville, Tenn. ....	40.0	22	36.3	11, 12	9.0	27.3
<i>Tennessee River:</i>						
Chattanooga, Tenn. ....	33.0	23	13.0	8, 12, 13, 15	4.6	8.4
Knoxville, Tenn. ....	29.0	24	7.3	12	1.5	3.8
<i>Monongahela River:</i>						
Pittsburgh, Pa. ....	29.0	16	20.0	2	5.6	14.4
<i>Savannah River:</i>						
Augusta, Ga. ....	32.0	31	9.4	26, 29	6.8	2.6
<i>Willamette River:</i>						
Portland, Oregon ..	15.0	31	10.0	6	0.8	9.2

\* Frozen.

The above table shows that the water was 3.7 above the danger-point at Cairo, Ill., on the 20th and 21st; 0.6 above at Memphis, Tenn., on the 26th; 0.5 above at Vicksburg, Miss., and 0.3 above at New Orleans, La., on the 31st.

#### ICE IN RIVERS AND HARBORS.

*Lake Michigan.*—Sheboygan, Wis.: the lake was entirely free from ice on the 3d, and boats could have passed through the straits. Small vessels were freighting lumber between Duncan and points above. Milwaukee, Wis.: a steamer arrived from Port Huron, Mich., on the 6th. This was the first arrival from a lower lake port in 1890, and the earliest arrival on record. Reports show that the Straits of Macinac were still open to navigation on the 31st, a condition never before known at that season of the year.

*Thunder Bay.*—Alpena, Mich.: Thunder Bay and Thunder River froze over on the 16th, closing navigation.

*Lake Ontario.*—Oswego, N. Y.: a schooner arrived from Kingston, Ontario, on the 16th, and the same boat returned to Kingston on the 18th. This was the latest trip made on Lake Ontario by either steam or sailing vessels in ten years.

*Machias River.*—Machias, Me.: the river was closed to navigation by ice on the 12th.

*Saco River.*—Biddeford, Me.: the river was closed to navigation by ice during the night of December 31st. The shipping season was reported the longest ever known at that place.

*Detroit River.*—Detroit, Mich.: floating ice in river, 25th and 26th.

*Saint Mary's River.*—Sault de Ste. Marie, Mich.: the river froze over for the first time this season on the 9th.

*Mississippi River.*—Davenport, Iowa: floating ice in river, 6th, 7th, and 8th. The river froze over on the 16th.

*Missouri River.*—Kansas City, Mo.: an ice gorge in the river at, and above, Saint Joseph, Mo., in the early part of the month, lowered the stage of the water at Kansas City to a point about two feet below the record, exposing the main suction pipe of the water works. Floating ice in river, 28th, 29th, and 30th.

#### LOW TIDE.

New London, Conn., 22d: owing to the strong northwest wind, the tide was very low in the harbor. Norwich, Conn.: the tide was lower in the Thames River on the afternoon of the 22d than it had been for several years.